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providing at least one sensor opposite to the rotational surface of the rotary shaft, the at least one sensor being operable to generate pulses when the marks pass the sensor during rotation of the rotary shaft; and

measuring the axial elongation of the rotary shaft from a change in an interval ratio of the pulses generated by the at least one sensor when the marks pass the at least one sensor during rotation of the rotary shaft.

15. The method of claim 14, wherein the plurality of marks comprises a reference mark and a measuring mark, and wherein the interval ratio of the pulses is the ratio of the time from detection of the reference mark until detection of the measuring mark to the time it takes for one rotation of the rotary shaft as determined by the at least one sensor.

16. The method of claim 14, wherein the at least one sensor is fixed.

17. The method of claim 14, wherein the sensor comprises a plurality of sensors corresponding respectively to the plurality of marks.

18. A rotary shaft axial elongation measuring device, comprising:
a plurality of marks provided on a rotational surface of a rotary shaft, wherein at least one of said marks is inclined relative to an axial direction of the rotary shaft;

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at least one sensor positioned opposite to the rotational surface of said rotary shaft, said at least one sensor being operable to generate pulses when said marks pass said at least one sensor during rotation of the rotary shaft; and

a data processing part operable to determine axial elongation of the rotary shaft from a change in an interval ratio of the pulses generated by said sensor when said marks pass the sensor during rotation of the rotary shaft.

Claim C2

19. The rotary shaft axial elongation measuring device of claim 18, wherein said plurality of marks comprises a reference mark and a measuring mark provided such that an interval between said reference mark and said measuring mark, in a circumferential direction of the rotary shaft, differs according to an axial directional position of the rotary shaft.

Claim C3

20. The rotary shaft axial elongation measuring device of claim 19, wherein said reference mark and said measuring mark comprise two grooves in the rotational surface provided so as to form a V shape.

Claim C4

21. The rotary shaft axial elongation measuring device of claim 20, wherein said at least one sensor is any one of a capacitance type gap sensor, an eddy current gap sensor and a photoelectric sensor.

22. The rotary shaft axial elongation measuring device of claim 19, wherein said reference mark and said measuring mark comprise two wire members fitted on the rotational surface of the rotary shaft in a V shape.

23. The rotary shaft axial elongation measuring device of claim 22, wherein said at least one sensor is any one of a capacitance type gap sensor, an eddy current gap sensor and a photoelectric sensor.

24. The rotary shaft axial elongation measuring device of claim 19, wherein said at least one sensor is any one of a capacitance type gap sensor, an eddy current gap sensor and a photoelectric sensor.

25. The rotary shaft axial elongation measuring device of claim 18, wherein said measuring mark comprises a groove provided in the rotational surface of the rotary shaft in a spiral shape.

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26. The rotary shaft axial elongation measuring device of claim 25, wherein said at least one sensor is any one of a capacitance type gap sensor, an eddy current gap sensor and a photoelectric sensor.

27. The rotary shaft axial elongation measuring device of claim 18, wherein said measuring mark comprises a wire member provided on the rotational surface of the rotary shaft in a spiral shape.

28. The rotary shaft axial elongation measuring device of claim 27, wherein said at least one sensor is any one of a capacitance type gap sensor, an eddy current gap sensor and a photoelectric sensor.

29. The rotary shaft axial elongation measuring device of claim 18, wherein said at least one sensor is any one of a capacitance type gap sensor, an eddy current gap sensor and a photoelectric sensor.

30. The rotary shaft axial elongation measuring device of claim 18, wherein said plurality of marks comprises a reference mark and a measuring mark, and wherein the interval ratio of the pulses is the ratio of the time from detection of the reference mark until detection of the measuring mark to the time it takes for one rotation of the rotary shaft as determined by the at least one sensor.

31. The rotary shaft axial elongation measuring device of claim 18, wherein said at least one sensor is fixed.

32. The rotary shaft axial elongation measuring device of claim 18, wherein said at least one sensor comprises a plurality of sensors corresponding respectively to the plurality of marks.